TROPICAL DISEASES BUREAU.

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DISEASES DUE TO PROTOZOAN PARASITES.

SERGENT (Edm.), DONATIEN (A.), PLANTUREUX (E.) & DEGUILLAUME (A.). **Notes sur les trypanosomiases (1921-1923).** [Notes on Trypanosomiases (1921–1923).]—*Bull. Soc. Path. Exot.* 1924. Feb. 13. Vol. 17. No. 2. pp. 130–131.

The authors promise a detailed account of the work, of which a brief account is given in this paper, in the *Archives de l'Institut Pasteur d'Algérie*.

The course of Debab.—The average period of incubation is a week and the first symptoms are a sudden rise of temperature associated with the appearance of parasites in the blood. For 3 or 4 months parasites are present in the blood irregularly and their irregularity is reflected in oscillations of the temperature. Death may occur during the acute phase.

If the animal survives, the disease becomes chronic. Parasites appear in the blood at increasing intervals, but their appearance is not associated with any febrile disturbance. During the intermissions, which may last for periods amounting to months, the animals have every appearance of perfect health. Inoculation of large quantities of blood into susceptible animals during intermissions often fails to cause infection. The chronic phase may last for years. Debab exerts an injurious effect in that it decreases the animal's capacity for work, renders it more liable to contract other diseases, and causes abortion. When the chronic phase is well established abortion does not occur.

Tartar emetic injected intravenously in watery solution has yielded results superior (7 cases) to those given by intramuscular injections of the salt in oil (1 case). Atoxyl has been found to be effective but doses bordering on the toxic dose must be used (2 cases). Novarseno-benzol is less toxic. 189, trepol, oxycyanide of mercury, biniodide of mercury, sodium salicylate, sulphate of copper, and quinine have been found to be ineffective in a small number of cases.

Two dromedaries which had passed through an attack of debab became infected when inoculated with *T. brucei*.

Cross immunity tests indicate that *T. marocanum* occurs in equines on the frontier between Algeria and Morocco. The authors point out that it is very advisable to establish the immunity of an animal to one species of trypanosome by repeated inoculations before using it for a cross immunity test with a second typanosome.

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Sheep and goats are less susceptible to trypanosome infections than dromedaries and may acquire not only a protection against them but an actual sterilizing immunity.

Observations show that the latter begins about two years after inoculation, while they acquire a condition of protection from 6 to 18 months after inoculation. The period of absolute immunity is unknown.

Distinction must be drawn between cross protection tests and actual cross immunity tests.

YORKE (Warrington) & MACFIE (J. W. S.). *Trypanosoma evansi* and *Ornithodorus crossi*.—*Ann. Trop. Med. & Parasit.* 1924. Apr. 30. Vol. 18. No. 1. pp. 125–126.

In view of the positive results reported by CROSS in the transmission of surra by means of *Ornithodorus crossi*, the authors obtained from CROSS about 200 of these ticks which had been fed upon a dog heavily infected with *T. evansi*.

The ticks had been fed on December 4th, 1922, and were received on January 10th, 1923. They were divided into four batches. Three were placed upon rabbits and one on a guineapig. Ample opportunities were given to the ticks to feed between January and June but none of the animals became infected. The ticks were kept in an incubator at 20° C.

As it was thought possible that the changes of temperature to which the ticks were subjected in travelling to England may have been a determining factor in these negative results, a further batch of ticks which had been fed on an infected dog was obtained during August 1923.

These were divided into two batches and were allowed frequent feeds upon a rabbit. Up to March 1924 infection had not taken place.

In two experiments in which *O. crossi* were fed upon rabbits infected with *T. rhodesiense* the parasites were found in their stomachs in a remarkable state of preservation when the ticks were dissected two months later. They were, however, incapable of infecting a mouse. The same result was obtained when the stomach contents of one of these ticks was used for the inoculation of a mouse on the day following a feed.

VELU (H.), BAROTTE (J.) & BALOZET. **Notes sur la valeur de la ponction du testicule dans la diagnostic de la dourine.** [Puncture of the Testicle in the Diagnosis of Dourine.]—*Bull. Soc. Path. Exot.* 1924. Apr. 9. Vol. 17. No. 4. pp. 298–301.

The authors have taken the opportunity of testing the value of puncture of the testicle for the diagnosis of dourine, as described by NEUMANN and DAHMEN.

They have had at their disposal for this purpose three stallions clinically affected, but they have also carried out observations upon rabbits inoculated from these for the purpose of maintaining the strain of parasites in the laboratory. One of the stallions was a donkey.

The puncture of the testicle was first practised some three months after the animals had become infected. They were at that time shewing clear clinical evidence of infection, and were about to undergo treatment with Bayer 205.

BRITISH MUSEUM

The animals were cast as for castration and the puncture was carried out with needles about 8–10 centimetres in length and ·7 to ·8 mm. in diameter, and was made right into the parenchyma of the organ.

A moderate amount of swelling occurred during the 24 hours following the operation but this subsequently disappeared.

Two moist preparations were made from each animal, and each was carefully searched for 20 minutes. Neither trypanosomes nor spermatozoa were found in any of them. The disappearance of spermatozoa could only have been temporary as a part of the disease.

The rabbits inoculated for the purpose of maintaining the strain were subjected to puncture of the testicles every 10 days, from the time of inoculation until the time of death. The material obtained was examined moist between a slide and coverglass.

In no case were trypanosomes found between inoculation and the first appearance of oedema, but the rapid movements of the spermatozoa which swarmed in the preparations would have in any case rendered it impossible to detect a trypanosome.

During the period between the first appearance of symptoms and the height of the disease, when spermatozoa were gradually diminishing in numbers, one or two trypanosomes could now and then be detected.

Subsequently, while the spermatozoa continued to decrease in numbers trypanosomes could be found with greater frequency, and the examinations were as a rule positive.

Prior to death the genital organs shewed marked swelling and scars.

At this stage trypanosomes were readily found in large numbers in the fluid obtained from the oedemas, from the liquid escaping from the testicles and from the testicles themselves.

Only the systematic examination of materials obtained from the testicles at various stages, followed by histological examination of sections of the organs, could furnish valuable information regarding the invasion of the testicles.

BLANCHARD & LEFROU (G.). **Essais du stovarsol dans la trypanosomiase humaine.** [Stovarsol in the Treatment of Human Trypanosomiasis.]—*Bull. Soc. Path. Exot.* 1924. Mar. 12. Vol. 17. No. 3. pp. 214–216.

The authors give accounts of eight cases of sleeping sickness treated with stovarsol. They found that a single dose of 2·5 to 3 grammes caused a disappearance of the parasites which lasted for about a month. Repetitions of the drug failed to achieve that effect. In fact, the effectiveness of the drug appears to depend upon the size of the dose rather than upon the total amount given.

SEI (S.). **Ueber die morphologischen Veränderungen der Trypanosomen bei Behandlung von Tieren mit "Bayer 205."** [The Morphological Changes produced in Trypanosomes as the Result of Treatment of Infected Animals with "Bayer 205."]—*Zeitsch. f. Hyg. u. Infektionskrankh.* 1923. Sept. Vol. 100. No. 3/4. pp. 416–424.

The author points out that there is still great uncertainty regarding the manner in which drugs produce their effects upon trypanosomes in the animal body, and he summarizes at some length the views that have been published in this connexion.

Effects may be produced by the drug itself, or as a result of reaction on the part of the body to the drug used.

In his own observations he has utilized mice infected with *T. brucei*, *T. equinum*, and *T. equiperdum*, and the doses of Bayer 205 have been minimal, that is to say minimal for curative purposes. They have ranged from ·000025 to ·00003 g. In examination of the blood he has used dried smears stained by Giemsa, holding that by this method, while minute details may be modified, the general form of the parasites is more accurately preserved.

The following observations were made. The effect of the drug is to increase the tendency to multiplication, and multiple divisions of the nucleus are frequently found. The cytoplasm becomes looser in texture and appears swollen. Displacement forwards of the blepharoplast is frequently seen in multiplying forms. Multiplication forms were seen in which one of the daughter parasites was abnormally small, and not infrequently possessed no nucleus. The latter abnormality is sometimes observed in untreated trypanosome infections. Parasites with a long posterior extremity, resembling that seen in *T. lewisi*, have also been found. Degeneration of the nucleus and the appearance of granules in the cytoplasm are also evidences of degeneration which have been encountered.

SERGENT (Edm.), DONATIEN (A.), PARROT (L.), LESTOQUARD (F.), PLANTUREUX (Edm.) & ROUGEBIEF (H.). **Etudes expérimentales sur les piroplasmoses bovines d'Algérie.** [Experimental Investigations of the Bovine Piroplasmoses in Algeria.]—*Ann. Inst. Pasteur.* 1924. Apr. Vol. 38. No. 4. pp. 273–343. With 42 text figs.

The authors point out that the bovine piroplasmoses or as they are more generally termed the " yellows " are the main obstacle to cattle rearing and improvement in Algeria. This is not only for the reason that they are responsible for serious losses, but they occur chiefly in the best irrigated portions of the colony and thus prohibit the use of some of the best pasture land.

In this long paper are published the results obtained during the last eighteen months. Details of the experiments are to be published in the *Archives de l' Institut Pasteur d'Algérie*, Vol. 2. No. 1. 1924.

As a result of their observations the authors conclude that five distinct diseases due to parasites of the blood corpuscles occur in bovines in Algeria. The parasites are : 1. *Piroplasma bigeminum*, 2. *Babesiella berbera* n. sp., 3. *Gonderia mutans*, 4. *Theileria dispar* n. sp., 5. *Anaplasma marginale.*

Piroplasma bigeminum was obtained in a state of purity from an animal infected at the same time with *A. marginale*, and *G. mutans* by a succession of rapid passages. By this means the short period of incubation of the parasite was put to good account. The strain was obtained pure at the third passage. It is noted that repeated re-inoculation of animals that have passed through an attack leads to a multiplication of the parasites without causing any rise of temperature.

Babesiella berbera n. sp.—This name is used to designate a piroplasm-like parasite belonging to the sub-genus *Babesiella* Mesnil 1919. It differs morphologically and biologically from the other

members of the sub-genus. The strain was obtained in the same manner as *P. bigeminum* from an animal shewing *Babesiella berbera*, *A. marginale*, and *G. mutans*, that is to say by a series of rapid passages through specially imported clean animals. The strain was obtained in a state of purity at the fourth passage and was maintained through ten subsequent passages.

The disease is characterized by a marked rise of temperature from 4 to 8 days after inoculation. The temperature remains up for 4 to 10 days and then the disease passes into the chronic condition. Parasites are discoverable in the blood in small numbers. On an average one per cent. of the corpuscles are invaded. The destruction of red cells ranges from 2 to 4 million per cubic millimetre. In spite of this, haemoglobinuria has been noted in one case out of eighteen.

The disease is a benign one and, would probably escape detection unless the temperature were taken daily. Trypan blue does not appear to be of any value. There may be relapses during the chronic phase of the disease. These are, however, very slight and are characterized only by an increase in the number of parasites in the blood.

Morphology of *Babesiella berbera*.—The authors describe four principal forms of the parasite. These are the anaplasmoid, round, elongated and dividing forms. The rounded forms are the most numerous, the elongated or sub-piriform type is slightly less common, while the others form a small minority. In multiplying a ring-shaped parasite is described as becoming an elongated oval which is subsequently constricted at its centre. At the final stage of division a slender thread of protoplasm joins the two daughter parasites. As many as four parasites have been observed in a single corpuscle.

Passage through bovines leads to no exaltation of virulence. At 24° C. the virus can be preserved in vitro for at least a week.

The sheep is not susceptible to infection, nor does it harbour the virus when inoculated.

Re-inoculation as a rule produces no reaction.

Gonderia mutans has been detected as a pure infection in three animals imported from France. The identity of the parasite was established by inoculation of healthy animals with their blood. The authors figure and describe the morphology of the parasite. They divide the forms observed into anaplasmoid, rounded, elliptical, rod-shaped, and cross-forms.

Theileria dispar n. sp.—This parasite resembles *T. parva* in many respects, but differs from it in that the infection is transmissible by blood inoculation and that anaemia and enlargement of the spleen are constant lesions.

This virus was isolated by successive rapid passages, and was obtained in a state of purity at the seventh passage.

The infection caused by this parasite is marked by an acute phase only. This does not pass into a chronic phase. The period of incubation is 12 to 24 days. The temperature rises rapidly and remains high for a period ranging from 1 to 14 days. During the febrile attack there may be slight remissions of the fever which last for a few hours. As a rule about four days after the initial fever has subsided there is a second rise of temperature which lasts from 1 to 6 days. Two distinct stages are described in the development of the parasite; these are the plasma bodies of Koch, for which the authors use the term "grenade" bodies, and the intracorpuscular forms.

The " grenade " forms are found in the internal organs and may be discovered by puncture. The interval elapsing between inoculation and the appearance of these forms ranges from 13 to 26 days. They are generally discoverable immediately the temperature rises. They disappear when the temperature falls. Punctures made prior to the rise of temperature and after its fall have invariably failed to reveal the presence of the parasites.

In specially severe cases " grenade " bodies may be discoverable in the peripheral blood.

The intra-corpuscular forms appear immediately or within a few days after the " grenade " forms. Sometimes they are present in large numbers from the beginning and at others they are scanty at first, increasing in numbers afterwards.

There is intense anaemia. The loss of corpuscles may amount to 3½ million per cubic millimetre. There is at the same time a leucocytosis.

Clinically the disease manifests itself by dullness and depression, swelling of the eyelids, lachrymation, congestion of the mucous membranes followed by gradual blanching associated with the appearance of petechiae. Rapid wasting, loss of appetite, atony of the rumen, constipation, acceleration of pulse and respiration are also symptoms. The superficial glands are recognisably enlarged, and sometimes haematuria is seen. In the final stages the cerebro-spinal system is involved.

The disease runs its course in about a fortnight to terminate in death or recovery, but death not infrequently takes place while the temperature is still high. Convalescence is slow. Recovery when it takes place is complete, the animals ceasing to harbour the parasite, and an attack confers immunity.

Lesions.—Emaciation, pallor of the muscles and a watery condition of the blood are constant. The heart shews subepicardial and sub-endocardial haemorrhages. The spleen may be as much as five times the normal size, the lymphatic glands enlarged and moist. The mucous membrane of the gastro-intestinal tract is congested, and may present ulcerations measuring up to one centimetre in diameter. The liver is enlarged and has a marbled appearance as a result of the presence of sub-capsular haemorrhages. Jaundice is seen in about 30 per cent. of cases. The kidneys shew congestion and not infrequently infarcts.

The disease occurs in certain parts of the country only, and is seen usually during the hot weather. It is noted that the examination of the glands and spleen for " grenade " bodies is useless six hours after death, as these forms rapidly disintegrate and disappear.

Two forms resembling those described by GONDER in connection with *T. parva* are recognisable. These forms have been found in all the organs at post mortem examination with variable frequence. In examinations made during life they have been found in 15 per cent. of cases in the superficial glands, in 28 per cent. of cases in the spleen, and in 94 per cent. in the liver.

The disease is transmissible to bovines of all ages, and recovery leaves a solid immunity.

The authors have encountered one case of natural immunity in a fifteen months old animal imported from France.

Anaplasma marginale.—This virus was isolated in a state of purity using passage through the sheep as described by LIGNIÈRES.

SERGENT (Edm.), DONATIEN (A.), PARROT (L.), LESTOQUARD (F.), PLANTUREUX (Edm.), & ROUGEBIEF (H.). **Inoculation au mouton de l'anaplasme du bœuf.** [Inoculation of Anaplasmosis from the Ox to the Sheep.]—*Bull. Soc. Path. Exot.* 1924. Apr. 9. Vol. 17. No. 4. pp. 295–298.

The authors have carried out experiments to control LIGNIÈRES' report (1919) that he had been able to transmit anaplasmosis from the ox to the sheep, to carry on the infection in sheep in series, and that in the sheep the blood remained infective for cattle for long periods.

In April 1923 two Algerian sheep were inoculated intravenously with 50 cc. of blood from a calf infected with chronic anaplasmosis. Neither had any rise of temperature, and one of them (No. 56) showed anaplasma-like bodies in its corpuscles 6 months after inoculation.

Two months after inoculation 100 cc. of this animal's blood were injected intravenously into a calf. The calf became infected. Parasites appeared in its blood on the 30th day and the maximum temperature recorded was 40·4°C. Six months after the inoculation blood was taken from the same sheep and injected intravenously in doses of 1, 50, and 100 cc. into three cattle. None became infected during a period of observation of 7 months. Blood was taken from sheep 56 four months after it had been inoculated and 50 cc. were injected intravenously into two sheep (Nos. 20 and 60). Neither shewed any evidence of infection. Sheep No. 20 was bled two months after inoculation, and 50 cc. was injected (intravenously ?) into sheep 38 and 39.

The blood of sheep 38 was injected a month later into two calves in doses of 50 and 200 cc. One was inoculated intravenously and the other intraperitoneally. Neither showed any evidence of infection. The experiment was repeated as follows. A sheep was inoculated intravenously with 50 cc. of blood from an infected heifer. Approximately 17 per cent. of the corpuscles contained parasites. One month later the sheep was bled and the blood used in doses ranging from 0·1 cc. to 100 cc. for the inoculation of 15 cattle. Only one of these—which had received 50 cc.—became infected. The temperature rose on the 48th day, and parasites were found in the blood. The maximum temperature recorded was 39·7°C. and about 8 per cent. of the corpuscles were found to contain parasites. Marked anisocytosis was observed for three weeks. The animals were under observation for 3½ months.

The authors therefore confirm LIGNIÈRES' statement that the virus can be preserved in the sheep, but not constantly. They have been unable to confirm his statement regarding the transmission of the infection in sheep in series.

LESTOQUARD (F.). **Les piroplasmoses du mouton en Algérie. Note préliminaire.** [Piroplasmoses of Sheep in Algeria. Preliminary Note.]—*Bull. Soc. Path. Exot.* 1924. Feb. 13. Vol. 17. No. 2. pp. 122–128. With 1 text figure.

The author has been able to identify three distinct piroplasms occurring in sheep in Algeria, viz., *Babesiella ovis* Babes, 1892, *Gonderia ovis* du Toit, 1918, and *Theileria ovis* Littlewood, 1914.

Babesiella ovis.—The disease for which this parasite is responsible is characterized by jaundice and haemoglobinuria. Two outbreaks were

detected on farms in humid areas during November and December 1923. The mortality was 5 and 10 per cent. respectively. The usual symptoms of fever are present. There is diarrhoea, which is not infrequently blood stained. Abortion occurs in pregnant animals and lactation is suppressed.

At the post-mortem examination the following lesions are found: Marked jaundice, a variable amount of blood-tinged liquid in the peritoneal cavity, ecchymoses on the heart, enlargement and yellow discoloration of the liver, haemorrhagic enteritis, enlargement of the spleen with sub-capsular haemorrhages, enlargement of the kidneys, with congestion and, sometimes, haemorrhages. The bladder contains a large amount of urine pigmented with haemoglobin. The causal organism is found in all the organs and in the blood.

The disease is transmissible by blood inoculation and the average period of incubation is a week. Fever lasts for five or six days, and parasites appear in the blood at about the time that the temperature first rises. The parasites are scantily present in the blood, only 1 to 6 corpuscles per thousand being invaded. In some cases clinical symptoms are very slight. There is a very marked destruction of the red blood corpuscles associated with a leucocytosis. Recovery leaves immunity. The disease is transmissible to the goat. The parasite is a small one, measuring 1 to 2·5 μ. The majority are ring-shaped with a central vacuole. Pear shaped forms are very scanty. In some cases anaplasma-like forms appear in the blood before the characteristic parasites. For the most part the invasion of the corpuscles is simple; double invasion being more rare.

Gonderia ovis.—This parasite has already been described by SERGENT, PARROT, and HILBERT. It is of very common occurrence in Algerian sheep, and it does not appear to possess any pathogenic properties. A simple examination of the blood of 202 sheep shewed that 65 per cent. were infected. Repeated daily examinations would probably have revealed the presence of the parasite in all of them. As a rule not more than 1 to 3 per thousand corpuscles contain parasites, which are usually present singly in them.

Theileria ovis.—This parasite has been detected twice, once in an animal imported from France ten months previously, and once in a native animal. The lesions are those generally seen in piroplasmoses, and it is noted that there is marked enlargement of the spleen which is dark in colour, and softened.

Koch's blue bodies are discoverable in smears from the organs. The parasites present in the red corpuscles closely resemble *Gonderia ovis*. Ring-shaped and elliptical forms predominate. Bacillary forms are very rare. The corpuscles invaded number some 2 per cent. In blood from the liver and spleen the figure is a little higher.

SERENA (P.) **Rinderpiroplasmose.** [Bovine Piroplasmoses.]—*Schweiz. Arch. f. Tierheilk.* 1924. Mar. Vol. 66. No. 6.

The author gives more or less full details of 22 cases of piroplasmosis observed by him in cattle in Switzerland. The diagnosis was apparently based upon clinical symptoms only, since no mention is made of the detection of parasites in the blood.

BONNE (C.) **La leishmaniose cutanée dans la Guyane hollandaise.** [Cutaneous Leishmaniasis in Dutch Guiana.]—*Bull. Soc. Path. Exot.* 1924. Apr. 9. Vol. 17. No. 4. pp. 293–295.

In Dutch Guiana cutaneous Leishmaniasis occurs in a number of forms—papular, ulcerative, eczematous, mucous, and leishmaniasis associated with lymphangitis and hypertrophy are described.

All forms, save the last, are cured by intravenous injections of a 1 per cent. solution of emetic in 5 to 10 cc. doses twice a week. Prolonged treatment is required in the hypertrophy form of the disease.

The disease occurs only in the forests in the interior.

ADLER (S.). **An Isospora of Civet Cats.**—*Ann. Trop. Med. & Parasit.* 1924. Apr. 30. Vol. 18. No. 1. pp. 87–94. With 1 plate.

The infection was observed in three civet cats, one adult and two young ones. The infection was fatal in the latter and the adult was killed for examination. The animals passed blood and mucus and a large number of oocysts in their faeces.

Development is confined to the lower half of the small intestine.

Schizonts normally produce 8 merozoites but sometimes only four are found. The nucleus of the merozoite is relatively large, has a distinct nuclear membrane, and contains a large karyosome.

Microgametocytes are distinguishable from schizonts by the fact that they tend to become rounded or elliptical, the schizonts maintaining a gregarine form until they have 8 nuclei; as many as 30 small nuclei can be detected when a microgametocyte measures only 6μ in diameter. The development of the microgametes follows the usual course.

The macrogametes become spherical early in their development, and the nucleus is very large, occupying in the early phases about half the cell. In the specimen examined the proportion of macrogametes to microgametocytes was about 30 to 1.

Fertilization takes place in the host cell prior to the formation of the oocyst-wall. As many as 10 microgametes have been observed in a macrogamete.

The protoplasm of the oocyst contains from 1 to 5 large refractile bodies which are extruded during the first development of the oocyst. These disappear before the development of the oocyst is completed. The first development of the oocyst takes place within the animal body —the oocysts containing 2 sporoblasts are passed out with the faeces. Oocysts passed with unsegmented protoplasm are probably unfertilized as they do not appear to develop outside the body.

Sporozoite formation requires 3 days after the parasites are evacuated. The sporocysts contain a granular residual body which gradually disappears.

The oocysts measure from 19μ to 27·5μ in length by 15·2μ to 24·7μ in breadth. The commonest size is 22·8μ by 19μ. The extreme measurements number only 2 per cent. The parasite most closely approximates to *Isospora rivoltae*, from which it is distinguished by the fact that the oocysts are passed when segmentation has occurred and that it was found impossible to infect 2 cats, 3 kittens, and 2 young dogs. The period of observation was 28 days. The name *Isospora viverrae* n. sp. is suggested.

DIEBEN (Caspar Petrus Antonius). **Over de morphologie en biologie van het rattencoccidium** *Eimeria nieschulzi* **n. sp. en zijne verspreiding in Nederland (Tevens vergelijkend onderzoek van de bekende coccidienopsporingsmethoden).** [The Morphology and Biology of the Coccidium of the Rat, *E. nieschulzi*.] [Thesis.]—119 pp. With 3 plates and 8 figs.

The following is abstracted from the author's English summary :—

The parasite has been found in wild rats (*Mus norvegicus* and *Mus rattus*).

The oocysts measure 18 by 14μ to 26 by 20μ. The cystwall is in 2 layers, and sometimes there is a limited " zone " both inside and outside the wall producing an appearance of 4 layers.

No micropyle has been seen.

Oocysts were collected by the " sugar floatation " method which was found to have the advantages that the oocysts remain intact, there is a clear field of vision, and the sugar solution does not influence the sporulation. Sporulation occurs in the manner described by METZNER for *E. stiedae*, and occupies about 3½ days. The sporozoites emerge from the sporocyst and from the oocyst within an hour in the animal host, and enter epithelial cells. The sporozoites measure 13·4μ by 2·25μ. Schizogony of the first generation is completed in 3 days. The schizonts sometimes shew a special twist. The merozoites vary very greatly in size, ranging from 7·5 to 26μ in length, by 1·5 to 1·8μ in breadth.

Microgametes measure 5·75μ on an average and about 0·7μ in thickness. They have 2 flagella. The period of development from sporozoite to oocyst is 8 days.

The parasite is not transmissible to the mouse, guinea-pig, and rabbit.

KNUTH (P.) & MAGDEBURG (F.). **Ueber Leukozytozoen bei der Hausgans.** [Leucocytozoa of the Goose.]—*Zeitschr. f. Infektionskrankh. parasit. Krankh. u. Hyg. d. Haust.* 1924.

The material described in this paper has previously received brief publication in the *Berlin. Tierärzt. Wochenschrift* (1922. Vol. 38. No. 31).

The parasite was first found in smears from the heart blood, liver, spleen, and peritoneum of a seven weeks old goose. The forms present in the blood were mostly spindle shaped, and appeared to represent sexual forms, while those in the smears from the organs appeared to be asexual.

Occasionally forms were found in smears from the organs, and less frequently in the blood which had the appearance of schizonts. These were included within mononuclear leucocytes. Merozoites numbered up to 18. Subsequently a number of geese were found to harbour the same parasite. Young birds were found to show evidence of illness as a result of the infection and in these both sexual and asexual forms occurred. In older birds which had recovered sexual forms were present in very sparing numbers only.

Observations indicated that the infection lasted from 4 to 6 weeks. Parasites made their appearance suddenly and after a period of multiplication gradually disappeared. Cases were encountered in which birds harbouring the parasite in considerable numbers shewed no evidence of ill-health.

NIESCHULZ (O.). **Amöben aus dem Zahnbelag von Pferden.** [Amoebae from the Teeth of the Horse.]—*Arch. f. Wissenschaft. u. Prakt. Tierheilk.* 1924. Ap. 25. Vol. 51. No. 1. pp. 41–44. With 1 text fig.

References to amoebae from the mouths of animals are very scanty. The author has found an organism closely resembling *Entamoeba gingivalis* of man on the teeth of a horse.

In the living condition the parasites measured only 7 to 12μ in diameter. No distinction between endo- and ectoplasm could be made out. At 37°C. the parasites were extraordinarily active, but motility was sluggish at room temperature.

SEIFRIED (O.). **Enzootische Typhlo-Hepatitis bei Truthühnern (Amöbiasis).** [Enzootic Typhlo-Hepatitis in Turkeys (Amoebiasis).]—*Berlin. Tierärzt. Wochenschr.* 1924. Feb. 7. Vol. 40. No. 6. pp. 65–66.

The author has found organisms which he considers to be amoebae in the diseased caeca of young turkeys affected with blackhead.

ILLERT (E.). **Kultivierung von Recurrensspirochäten in künstlichen Nahrmedien unter Berücksichtigung ihrer Virulenz für den Menschen.** [The Cultivation of Spirochaetes in Artificial Media, with special reference to their Virulence for Man.]—*Zeitschr. f. Hyg. u. Infektionskrankh.* 1923. Sept. Vol. 100. No. 3/4. pp. 350–356.

The difficulties associated with the maintenance of strains of spirochaetes in mice led the author to attempt to find some artificial medium in which strains might be kept running.

NOGUCHI's method of cultivating spirochaetes was found to be of little practical value because the parasites could not be kept alive in it for any great length of time. UNGERMANN in 1918 claimed to have overcome this difficulty by obtaining cultures in inactivated rabbit serum to which a small amount of fresh rabbit blood was added. Other investigators have reported regarding this method of cultivation.

In the author's experiments rabbit serum was placed in tubes in quantities of 0·75 to 1 cc. (These small amounts were used on the score of economy.) They were then covered with a layer of paraffin and inactivated by heating to 60°C. for an hour. The serum used should be obtained from young animals and slightly haemolysed serum is quite good for culture purposes, but it has been noticed that in such sera the cultures maintain their vitality for a shorter time. The fresh rabbit blood is added with a pipette immediately before the tubes are used.

Transplantations to fresh tubes were made every 4th or 5th day, and cultures were found to retain their vitality longer when incubated at 30 to 32°C. than at 37°C. In this way the author has been able to carry on two strains through 36 and 25 generations respectively. Only a very small amount of fresh blood was required, and experiments in which the inactivated serum alone was used gave very poor results. Absolute sterility of the serum is essential.

It has been found that the spirochaetes do not require strict anaerobic conditions for growth, and that it is not essential to use a layer of paraffin on the surface of the serum. It has been suggested that the fresh blood which is added is not in the nature of a food material but that it acts as a buffer and maintains a certain hydrogen ion concentration in the medium. The blood can be replaced by pieces of cooked white of egg and the serum can be diluted with normal saline solution in the proportion of 5 to 1. Illert has not been able to distinguish morphologically between the spirochaetes of relapsing fever of European and African origin. Multiplication is by transverse division and the simultaneous division of a single long parasite into three or four parts has not infrequently been seen.

Cultures in which the spirochaetes multiply rapidly and are themselves actively motile infect animals more readily than those in which multiplication is slow and motility sluggish.

The European strain of spirochaetes appeared to lose its pathogenicity for man under cultivation, but the African strain retained its pathogenic powers to the full.

VERGE (J.). **Spirochaetoses aviaires.** [Avian Spirochaetosis.]—*Rev. Path. Comp. et Hyg. Gén.* 1923. Nov. Vol. 23. No. 241. pp. 695–706.

This paper is in the nature of a summary of existing knowledge and appears to contain nothing new.

DISEASES DUE TO METAZOAN PARASITES.

DE BLASI (Dante). **Rapido saggio preliminare per riconoscere gli ovini affetti da uncinariosi od altra malattia anemizzante affine.** [A Rapid Method of making a Preliminary Diagnosis of Uncinariasis and other Allied Infections producing Anaemia in Sheep.]—*Ann. d' Igiene.* 1924. Jan. Vol. 34. No. 1. pp. 30–33.

The author has previously shown that injection of a haemolytic serum into sheep produced two results : (1) A haemolytic action bringing about destruction of a certain number of the red cells ; (2) a " haemocatatonic " action, lowering the resistance to solution of the remaining red cells, as shown by haemolysis taking place in a 0·62 per cent. saline.

The method is applied to estimate the haemolytic action resulting from infection of sheep with *Uncinaria cernua*. Thus, the number of corpuscles per cmm. of the blood of a healthy lamb was found to be 12·5 millions when diluted with 3 per cent. sodium chloride ; in citrate-saline equivalent to 0·62 per cent. salt solution 12·3 millions. The animal was then infected by larvae of *U. cernua* and ova appeared in the faeces 15 days later. On the eighteenth day after feeding the above estimations were again carried out, and in the 3 per cent. NaCl the erythrocytes numbered 12·2 millions, whereas in the citrate-saline they were reduced to 3·2 millions. In the blood of sheep infected with Echinococcus or Fasciola the two counts remained practically normal. The author next applied the test for the purpose of diagnosing uncinariasis. Taking the blood of an infected sheep and mixing it

with the citrate-saline in a Thoma-Zeiss pipette and shaking, the cells were haemolysed and the fluid became a clear rose colour. The test can be even more readily carried out by withdrawing a drop or two of blood from the ear with an ordinary capillary pipette and placing it in a tube containing the citrate-saline. In the case of an uninfected animal the fluid remains turbid, no haemolysis occurring. The method is a simple one, rapidly carried out, and it forms a ready means of separating the infected members of a flock, confirmation being made by a faecal examination before treatment is undertaken. If it proves as satisfactory in other hands the test will certainly obviate the tedious work of making a large number of faecal examinations, many of which may be negative.*

ADLER (S.). **Ancylostomes in a Leopard.**— *Ann. Trop. Med. & Parasit.* 1924. Apr. 30. Vol. 18. No. 1. p. 128.

In a brief note the author records the recovery of six specimens of *A. braziliense*, Gomez da Faria 1910, from a young leopard in Sierra Leone. Eleven specimens of *A. caninum* were also recovered.

THIROUX (A.). **Sur un procédé destiné à empêcher l'infestation du sol par les larves d'ankylostomes dans les pays chauds.** [A Method of preventing the Infestation of Soil by Ankylostome Larvae in Hot Countries.]—*Bull. Soc. Path. Exot.* 1924. Apr. 9. Vol. 17. No. 4. pp. 303–306.

The objection to burning the faeces of persons infected with ankylostomes for the destruction of the eggs is that it requires so large an amount of wood for the purpose. The faeces of 400 coolies require about 3½ cwt. of wood.

It was at one time thought burying faecal matter was sufficient because the larvae were unable to come to the surface. This, however, is now known to be ineffective in most countries. It was found by PAYNE that in sandy soil larvae buried at a depth of a yard could reach the surface. It was further found that this could be achieved whether the eggs were buried before hatching or not. The number of larvae reaching the surface is indirectly proportional to the depth. In red clay containing a little sand larvae were found to reach the surface from a depth of about 9 to 10 inches, and in pure clay migration did not occur at a depth greater than 6 inches.

PAYNE'S further observations showed that ants and earth worms also bring a small number of larvae to the surface.

The mission of which PAYNE was a member came to the conclusion that the best means of combating soil infestation was the reduction in the number of carriers by mass treatment.

In 1918 SERGENT & LHÉRITIER described a method in which two hermetically sealed trenches of reinforced concrete were used; one being in the process of filling while in the other fermentation was taking place. Each process required about 10 days. The material removed after fermentation was used for agricultural purposes and no fly larvae ever developed in it.

* Summarized by Dr. H. Harold Scott.

ROUBAUD showed in 1915 that the larvae of flies were killed in a fermenting dung heap by a temperature of 50° C. in 3 minutes, and in 4 to 5 seconds by a temperature of 60° C.

Making reference to BECCARI'S work on similar lines, Thiroux concludes his paper by suggesting that a similar method might be applied for the destruction of ankylostome larvae.

MARTIN (M. A.). **L'évolution des Ascarides; la pneumonie ascaridienne.** [Pneumonia due to the Development of Ascarides.]—*Rev. Vét.* 1924. Feb. Vol. 76. No. 2. pp. 69–76.

This article is a summary of existing knowledge regarding the migrations of ascarides in the body in the course of their development.

PILLERS (A. W. N.). *Ascaris lumbricoides* **causing Fatal Lesions in a Chimpanzee.**—*Ann. Trop. Med. & Parasit.* 1924. Apr. 30. Vol. 18. No. 1. pp. 101–102.

The female chimpanzee died a few days after arrival in this country. There was no definite history. The following lesions were found:—Icterus of the skin, and slight inflammation of the mucous membrane of the small intestine in which were found 63 specimens of *Ascaris lumbricoides*. These ranged from 6·5 cms. (males) to 15·75 cms. (females) in length.

The right lobe of the liver contained three abscesses, each having within it a degenerated worm measuring 9 cms. in length. In the left lobe was a partially degenerated female about 13 cms. in length which appeared to be lying in a bile duct. Six partly decomposed worms were found at the junction of the cystic and hepatic ducts.

THORNTON (H.). **The Relationship between the Ascarids of Man, Pig and Chimpanzee.**—*Ann. Trop. Med. & Parasit.* 1924. Apr. 30. Vol. 18. No. 1. pp. 99–100. With 2 text figs.

The author has examined specimens of *Ascaris lumbricoides* obtained from Accra, *Ascaris suilla* from pigs killed in the Liverpool abattoir, and a few ascarides from a chimpanzee, and concludes that since no morphological differences can be detected the parasite of the pig and chimpanzee should be designated *Ascaris lumbricoides*, Linn.

BOUGERT (J.) & HOCK (R.). **Aorten-Würmer.** [Worms from the Aorta.]—*Zeitschr. f. Infektionskrankh. parasit. Krankh. u. Hyg. d. Haust.* 1924. March 24. Vol. 26 (no. not given). pp. 116–126. With 1 plate.

The author refers to previous publications regarding the occurrence of worms in the aorta of buffaloes which have appeared in the course of the last 30 years. He then describes lesions found in a buffalo imported from the Philippines.

There was found dilatation of the aorta in the posterior thoracic part. On division the wall was found to be 12 mm. thick at the thickest part, and this gradually decreased in the backward direction. The lumen of the vessel was filled with red clots, which when they were removed exposed a brownish grey clot about 140 mm. in length and containing a tangled mass of worms. There were also found six rounded

prominences projecting into the lumen of the vessel. These were about 12 mm. in diameter and 7 mm. high. They were firmly attached to the vessel wall and had an irregular distribution. From each of these nodules there projected a worm, but in no case was it from the summit. The worms emerged at the junction of the nodule with the arterial wall, and on the distal side. The two largest worms were 105 mm. long and 2 mm. thick.

There were, in addition to these, a number of much smaller worms attached to the surface of the nodules, to the surface of the blood vessel and in the substance of the clot.

The dilated portion of the vessel measured 170 mm. in length, and when laid open flat 91 mm. across.

The interior of the vessel showed long wrinkled ridges and depressions.

The thickening of the vessel wall mainly involved the tunica media, and it varied in extent from place to place. On section one of the nodules was found to be very hard, but it did not appear to be at all calcified. Examination of sections showed that where the thrombus was attached to the vessel wall the intima was absent and that organization of the thrombus was taking place. It showed no evidence of stratification. Sections of the worm could be found in the interior of the lesion. At places free from thrombus the intima was thickened. In the media the elastic fibres which are normally present in large amounts in the aorta of the buffalo were largely replaced by fibrous tissue. Blood corpuscles were present scattered through this tissue, and the general appearance presented was that of an early stage of aneurism formation.

Examination of the blood, liver, spleen and kidneys failed to reveal any other worms or embryos.

The author concludes that the worm is not a true blood parasite, since it nourishes itself from the vessel wall.

According to RAILLIET the worm presents characters which resemble those of Onchocerca, and it has therefore been placed in the subfamily "Elaeophora" of this genus.

LEBASQUE. **Rupture de l'aorte postérieure d'un chien consécutive à la spirocercose.** [Rupture of the Posterior Aorta in a Dog as a Result of Spirocercosis.]—*Rec. Méd. Vét.* 1924. Feb. Vol. 100. No. 4. pp. 122–123.

The dog was 4 months old and came under observation on account of its general poverty of condition and of marked weakness of the hind quarters. There was no evidence of distemper. As worm parasites are of common occurrence in Beyrout (where the case recorded was encountered) the puppy was kept under observation for these. Before a definite diagnosis could be arrived at the dog died. Prior to death, for about an hour, dyspnoea and tremors were noticed.

Death was found to be due to rupture of the aorta following atheromatous degeneration brought about by the invasion of the artery by *Spirocerca sanguinolenta*. The posterior aorta showed, in its thoracic portion, seven tumours due to spirocerca. These, which were visible from the exterior of the vessel, were about the size of peas. One of the larger "tumours" was responsible for the haemorrhage. An adult spirocerca was found in each of the lesions. The oesophagus and stomach showed no evidence of invasion by parasites.

In tropical countries weakness or paralysis of the hind legs in the dog should always, in the absence of recognisable cause, lead to the suspicion that spirocerca may be responsible.

SOUTHWELL (T.) & ADLER (S.). (i) *Ophiotaenia marenzelleri.*—*Ann. Trop. Med. & Parasit.* 1924. April 30. Vol. 18. No. 1. p. 129.

The authors record the discovery of a specimen of *Ophiotaenia marenzelleri*, La Rue 1911, in the intestine of *Causus rhombeatus* in Freetown, Sierra Leone.

(ii) *Zschokkeella guineensis.*—*Ibid.*

They also record the detection of *Zschokkeella guineensis* (Graham, 1908) in the intestine of a ground pig (*Thrinomys swinderianus*).

ROUBAUD (E.) & PÉRARD (C.). **Etudes sur l'hypoderme ou varron des bœufs ; les extraits d'oestres et l'immunisation.** [*Hypoderma bovis.* Extracts of the larvae, and Immunization.]—*Bull. Soc. Path. Exot.* 1924. Mar. 12. Vol. 17. No. 3. pp. 259–272.

As has been the experience of other investigators, Roubaud and Pérard have obtained very poor results in their attempts to hatch flies from the larvae emerging from the skin. From over a hundred larvae, a good number of which formed pupae, only 3 or 4 flies have been obtained. From the context it appears that the larvae used had not made their exit from the skin spontaneously, but had been pressed out. The experience of other investigators appears to indicate that this in itself is a factor adverse to the obtaining of the imago. This failure to obtain flies has prevented the authors from carrying out some of the experiments that had been designed, and they therefore concentrated their attention upon the question of the apparent immunity possessed by young animals and those of mature age as compared with animals from 2 to 4 years of age. Statistics collected in the abattoirs of Paris show that 78 per cent. of infested animals are between 2 and 4 years old, 11 per cent. are from 1 to 2, and 11 from 4 years upwards. On the other hand, CARPENTER and STEEN in Ireland found that the majority of infested animals were about a year old, calves coming next in order of frequency. It has also been observed that animals under 4 years of age are usually far more heavily infested than aged animals. The differences observed in the infestation of animals at different ages are referable to the difference in age at which they are sent to pasture and the long period of development of the parasite. There appears to be evidence that the comparative freedom of adult animals from infestation is in some way connected with an acquired immunity, and a similar series of facts has been shown in the case of another parasite, *Cordylobia anthropophaga*. In the case of Hypoderma the authors think that this immunity may result from the absorption of the tissues or secretions of larvae which fail to achieve their full development. The possibility of immunizing cattle experimentally against Hypoderma has suggested itself to the authors and they have carried out experiments with extracts of third stage larvae. In view of the difficulty of obtaining these larvae they have carried out a parallel set of experiments with *Gastrophilus intestinalis*. This parasite is readily obtainable. Extracts prepared with water and with glycerine have been used.

The extracts of Hypoderma have been found to be relatively non-toxic for rabbits, guinea-pigs, rats, and mice.

Only one experiment appears to have been carried out with a bovine animal. This was given a series of subcutaneous injections of extract of third stage larvae after filtration. They have not observed any immediate reaction nor any evidence of anaphylactic shock. It is noted that the animal used had not previously been infested naturally. Reference is made to the results obtained by HADWEN, BRUCE and BRODERSEN.

In their experiments with extracts of Gastrophilus the authors have found, as has DE KOCK, that unfiltered extracts are markedly toxic for laboratory animals, while filtered extracts produce no such effects. In all the experiments carried out freshly prepared extracts appeared to be more active than extracts which had been desiccated. An attempt has been made to immunize two bovines, one with Hypoderma extract and the other with Gastrophilus extract. These animals have been exposed to natural infection, but the authors have no information as to the results.

Experiments designed to show whether small animals acquired any immunity as a result of injection of extracts failed owing to bacterial infections. These animals had larvae of the first or second stage introduced under the skin.

GROOTFONTEIN SCHOOL OF AGRICULTURE. **Destruction of Blow-fly Maggots : an Experiment.**— *Jl. Dept. Agric.* Pretoria. 1924. April. Vol. 8. No. 4. pp. 416.

The object of the experiment was to ascertain how many blowflies breed in a carcase of a sheep left out on the veld and not properly disposed of. On the tenth day after the carcase had been left out a gauze cage was placed over it and the flies were caught as they emerged. It was surprising to find that although an immense number of maggots had been observed, only 500 flies were caught. When emergence of flies ceased the carcase was examined and hundreds of small brown pupal cases which had not opened were found. These on examination were found to be full of the pupae of another insect, the average number present being about 30. Over 60 per cent. of the blow-fly maggots had thus been destroyed. After a further three days the flies began to emerge from these pupae. The species has not been definitely determined, but it is thought to be *Mesocomys pulchriceps*, belonging to the family Chalcididae. Little is known about it, but it appears to assist in combating the blow-fly pest.

YORKE (Warrington) & MACFIE (J. W. S.). **The Action of the Salivary Secretion of Mosquitos and of *Glossina tachinoides* on Human Blood.**— *Ann. Trop. Med. & Parasit.* 1924. Apr. 30. Vol. 18. No. 1. pp. 103–108.

The authors find that an emulsion of the salivary glands of *Anopheles maculipennis* agglutinates the red corpuscles of man, donkey, rabbit, and dog. It has no such effect upon those of the mouse, guinea-pig, and cercopithecus sp. The agglutinin is readily destroyed by heat, and heat also caused agglutinated red cells to become completely dissociated.

Similar emulsions of the salivary glands of *Culex pipiens*, *Theobaldia*

annulata, *Stegomyia fasciata*, and *Glossina tachinoides* do not agglutinate red cells from human sources, and *A. bifurcata* and *Stegomyia fasciata* do not agglutinate the red corpuscles of any of the animals mentioned. The emulsion from the glands of *A. maculipennis* and *G. tachinoides* exerted a definite anti-coagulating effect.

MORISHITA (K.O.R.). **A Pig Nematode, *Gnathostoma hispidium*, Fedchenko, as a Human Parasite.**— *Ann. Trop. Med. & Parasit.* 1924. Apr. 30. Vol. 18. No. 1. pp. 23–26.

THEILER (G.). **On the Anatomy of *Taenia festiva*, Rudolphi, 1819.**— *Ann. Trop. Med. & Parasit.* 1924. Apr. 30. Vol. 18. No. 1. pp. 3–13. With 7 text figs.

——. **On the Classification of the Cestode Genus Moniezia (Blanchard 1891).**— *Ann. Trop. Med. & Parasit.* 1924. Apr. 30. Vol. 18. No. 1. pp. 109–123. With 12 text figs.

ERRATUM.

Vol. 12, No. 2, p. 56, LANE summary, line 10, for "symmetrical" (bursa of Heligmosomum or Nippostrongylus) read "asymmetrical."

BACTERIAL DISEASES.

GMINDER (A.). **Zur Frage der Bekämpfung des ansteckenden Verkalbens.** [The Control of Contagious Abortion in Cattle.]— *Zeitschr. f. Infektionskrankh. parasit. Krankh. u. Hyg. d. Haust.* 1924. March. Vol. 26. (No. not stated.) pp. 87–100.

Vaccination must only be carried out in conjunction with laboratory investigations as to the state of affairs in the herd regarding the degree of dissemination of the disease. Hygienic measures must be enforced.

EMOTO (O.). **Further Studies on the Nature of Lumbar Paralysis in the Goat.**— *Jl. Jap. Soc. Vet. Sci.* 1924. March. Vol. 3. No. 1. Author's English Abstract, pp. 66–67.

The author has isolated the streptococcus which he has previously described as being the cause of this disease from 24 cases. The organism is small, occurs in pairs or short chains, is Gram-positive, and does not grow well upon artificial media. Haemolysis is caused in blood agar with the production of clear zones. The organism ferments the principal sugars. Twenty goats inoculated intraspinally with cultures showed anatomical and histological changes similar to those found in natural cases, more particularly if the animal's resistance was lowered by bleeding, or the intravenous injection of serum obtained by immunizing rabbits against tissue from the central nervous system of the goat. "Satisfactory" results were obtained in agglutination, complement fixation, and precipitin tests. The name *Streptococcus caprinus* is suggested.

GRIFFITHS (J. A.). **Necrotic abomasitis in Cattle.**—*Vet. Jl.* 1924. May. Vol. 80. No. 5. pp. 200–201.

The cases occurred among yearling heifers in the Highlands of Nyasaland. As two of the animals had died within two days of being dipped arsenical poisoning was suspected.

One of the animals which was ill had a temperature of 104·8° F. and respiration was slightly accelerated. Slaughter was decided upon. All the organs were apparently normal save the abomasum. This showed an area of necrosis of the mucous membranes about 6 inches in diameter. The muscular coats at the site of the lesion were black in colour and there was localized peritonitis. Analysis for arsenic was negative. Bacillus necrosis was found in the lesion. An animal which had died some hours earlier was examined and a similar lesion found.

WHITWORTH (S. H.). **The Influence of Hydrogen ion Concentration on the Biology of the Anthrax Organism.**—*Thesis presented to the Veterinary Faculty of the University of Zurich.* 1924. pp. 1–130.

This thesis is divided into two parts, viz., an introductory portion containing a general account of the theory of hydrogen ion concentration, its application to the preparation of culture media, and the limits of concentration which permit growth to take place. The second part, comprising about a hundred pages, contains the account of the author's own investigations. The nitrophenol indicators described by MICHAELIS were used in determining the pH values of the media.

Only very slight changes were observed in media during and after sterilization between pH 6·8 and 8·4. The changes above pH 8·0 were associated with precipitation, particularly in highly buffered media. Generally speaking, the following conclusions were arrived at regarding the influence of the H-ion concentration upon the growth of the anthrax bacillus. The range for growth in broth and on agar is pH 6·4 > pH 8·4. While in broth the optimum pH is from 7·8 to 8·1, on agar the range is pH 7·5 to 7·8.

Individual spores show special adaptability to grow in acid or alkaline media. Provided the media be not too alkaline a good growth may be obtained. This is possibly due to a lowering of the pH value by acid produced during growth.

Delay in sporulation results from the use of excessively acid or alkaline agar.

The power to grow in media of low pH value was lost by subculturing in similar media.

During growth the bacillus of anthrax produces acid.

The heat resistance of anthrax spores is influenced by the pH of the medium in which they are suspended. The optimum pH for resistance at 85° C. is pH 7. On either side of this value the resistance decreases, but it is more marked on the acid side.

The resistance of individual spores varies, even when the medium has a low pH value.

VILJOEN (P. R.). **Anthrax. Its Nature and Control.**—*Jl. Dept. Agric.* Pretoria. 1924. March. Vol. 8. No. 3. pp. 276–285. With 4 text figs.

The object of this paper is to set out the main points to be borne in mind when methods of combating anthrax are being carried out.

The disease has become a serious menace to stock in South Africa, and the Government are distributing anthrax vaccine free of cost to stock-owners. It is estimated that the cost of this is at least £30,000 per annum. Anthrax has spread to a very marked extent during recent years. The greater prevalence of the disease during the summer—at least among horses—is due to the increase in the number of horse-flies.

The main biological characteristics of the organism are described in simple language so as to lead up to the question of combating the disease. There then follow descriptions of the symptoms and lesions and these are followed by paragraphs relating to diagnosis.

Two main factors are concerned in the control of the disease: (1) The proper disposal of carcasses, and (2) keeping animals away from infected parts of farms or the use of reliable methods of protective inoculation.

While protective inoculation will reduce immensely the incidence of anthrax, it is not possible by its means to confer complete immunity in all instances. The reasons for this are as follows:—(1) A few individuals will not respond to vaccination, (2) local difficulties may prevent all the animals being properly inoculated, (3) the immunity is relative and may break down if a very large dose of infective material be swallowed, (4) multiplicity of strains may be responsible for incomplete immunization, (5) variations in susceptibility.

BÉGUET (M.). **L'agglutination des *Brucella melitensis* et le séro-diagnostic de la fièvre ondulante. Causes d'erreur et précautions nécessaires.** [The Agglutination of *Brucella melitensis* and the Serum Diagnosis of Undulant Fever. Causes of Error and the Necessary Precautions.]—*Bull. Soc. Path. Exot.* 1924. Feb. 13. Vol. 17. No. 2. pp. 110–114.

The author has found that different strains of *Br. melitensis* vary greatly in their power of producing agglutinins in the blood of animals experimentally infected.

Their experiments have been carried out with 17 strains of *melitensis* and 3 of *abortus*.

These differ more or less among themselves as shown by cross agglutination tests, but the results do not permit of the recognition of definite groups among them.

In cross agglutination tests heating the serum to 56° C. for 30 minutes has little or no effect upon the agglutination when the emulsion used is prepared from the strain used as antigen in the preparation of the serum or from one closely resembling it. There is, however, a distinct lowering of the agglutinating power when the emulsion is prepared from a markedly different strain: a serum which possesses a weak agglutinating power for a particular strain may lose that power entirely on heating. In one case the agglutinating power was higher after heating than before. This the authors consider as a paradoxal reaction similar to that seen when a strong dilution of serum causes less agglutination than a weak one. The suggestion is put forward that heating destroys some anti-agglutinating substance that is present.

They have not been able to differentiate *B. abortus* from *melitensis* either by experimentally prepared anti-sera or by sera from natural cases of undulant fever.

The strains of organisms have been used for tests of 150 sera from healthy persons or from persons suffering from diseases other than undulant fever. One hundred and forty-two of these have shown agglutinating power ranging from 1 in 20 to 1 in 500 for the strains of *melitensis*. Heating has in most cases destroyed this power. It was possible to grade the various strains of *melitensis* according to their agglutinability by non-specific agglutinins ranging from most susceptible to least susceptible, but this was not possible with specific agglutinins. Extensive and prolonged experiments will be necessary to determine whether strains become modified during artificial cultivation.

HUBER (F. L.). **Over de immunisatie tegen septicaemia haemorrhagica in het bijzonder bij den indischen buffel.** [On Immunization against Septicaemia haemorrhagica, especially of the Indian Buffalo.]—*Nederl.-Indische Bladen v. Diergeneesk. en Dierenteelt.* Vol. 34. No. 6. pp. 402–427.

This is the first of a series of papers and deals with the previous publications. Although it would seem to lie outside the scope of this Bulletin, which mentions original articles only, it may be useful to give an abstract of the part dealing with the Dutch East Indian researches.

On the suggestion of DE BLIECK, experiments were undertaken to immunize buffaloes against the "barbone" or bovine septicaemia, caused by *Bacillus bipolaris septicus* var. *bubalisepticus*, belonging to the group of Pasteurella, well known by PASTEUR'S classical experiments on immunization against chicken-cholera. A preliminary experiment was performed in 1910 to test the harmlessness of the vaccine. SMIT in Tjibaroesa (Buitenzorg) immunized 1,600 buffaloes, each with 1 c.c. of vaccine (prepared by killing a broth-culture at 55° C.), combined with 10 c.c. of immune-serum, 5 animals becoming ill in consequence of the treatment; the cultures were heated at 65° C. for an equal time.

In 1911 SMIT & BUBBERMAN used a vaccine prepared by rinsing with saline the surface of an agar-culture aged 48 hours and subsequently killing this suspension by heating it 1 hour at 55° C. Twenty buffaloes were immunized with 2–3 c.c. of the vaccine. Four months later they proved to be resistant against a lethal dose of a highly virulent strain. During the period June–October, 1912, VERMEER, in the Bantam residency (Java), used 5,000 c.c. of this vaccine to immunize 3,548 buffaloes. With the exception of 7 which, apparently, had become infected before the beginning of the experiment, the disease becoming apparent 3 days after the injection, all the animals remained healthy up to January 1st, 1913. Serum of highly immunized animals was also used with advantage. It confers an immunity lasting for 3 weeks only and it is to be injected in doses of 20 c.c. (preventive) or 50–100 c.c. (curative).

Much stress is laid on the necessity of preparing the vaccines (or immunizing the animals producing the sera) with as many local strains as possible, preferably using in each epidemic the particular strain causing it.*

*Summarized by Dr. W. H. Swellengrebel.

DISEASES DUE TO FILTERABLE VIRUSES.

DU TOIT (P. J.). **Horse-sickness in 1923.**—*Jl. Dept. Agric.* Pretoria. 1924. Apr. Vol. 8. No. 4. pp. 370–382.

The year 1923 was one of the worst seasons for horse-sickness experienced as yet. As the rainfall was heavy a bad season was expected, but it proved to be far worse than was anticipated. The mortality reached its highest point during March. Reports were received regarding the deaths of a number of donkeys during the season, but while the figures tabulated suggest that horse-sickness was the cause of death, there is no actual evidence that this was so. It has generally been held that while donkeys will react to an injection of virus, death does not as a rule occur in that species.

Steps were taken to ascertain what was the mortality among the horses inoculated in 1922, and the figures indicated that 17·6 per cent. of these died. It is to be noted that in making the statistics the whole number of horses, mules, and asses dying during the horse sickness season were assumed to have died of horse sickness. The figures given are therefore in all probability too high. Twenty-nine per cent. of the horses inoculated during 1922 showed relapses and recovered. There is a body of opinion among the farmers that inoculated horses which relapse will recover if they are properly cared for and that the immunity possessed by inoculated horses is stronger than that resulting from natural salting. It is not thought that inoculation has any effect upon the animals' stamina. At the Government farm at Kaalplaats, a bad farm for horse sickness, the percentage of deaths and of relapse with recovery was approximately the same as in the whole country. Also hyperimmune horses were attacked in about the same proportion as immune horses.

FROSCH & DAHMEN. **Die Entdeckung des Maul- und Klauenseuche-erregers.** [The Discovery of the Cause of Foot and Mouth Disease.]—*Berlin. Tierärzt. Wochenschr.* 1924. Apr. 10. Vol. 40. No. 15. pp. 185–187.

The following is abstracted from an abbreviated account of a meeting of the Berlin Microbiological Society held on April 7th, 1924, published in the above Journal.

The discovery of the causal organism of foot and mouth disease was the result of some photographic investigations carried out by Frosch. In these experiments ultra-violet light was used, and in photographs of diluted vesicular fluid taken by its means the small rod-shaped organism was discovered. These are slightly longer than they are broad and measure about 0·1μ in length.

This discovery led to attempts on the part of Dahmen to cultivate the organism. He concentrated his attention upon obtaining cultures on solid media because of the uncertainty attaching to the use of liquid media in appraising turbidities produced in them. Dahmen held that the fluid from vesicles probably exerts a noxious effect upon the virus since in his view it is a reaction product of the body for the purpose of destroying the virus. He therefore took steps to separate the virus, which in his opinion must be particulate, from the liquid in which it occurs. This separation was achieved by centrifuging. With the material sedimented Dahmen was able to obtain cultures on solid

media. The colonies were about the size of a red blood corpuscle and consequently were invisible until magnified. By means of these cultures guinea-pigs were infected and success in this respect was achieved with cultures which had passed through a number of generations (26).

MANOUELIAN (Y.) & VIALA (J.). **"Encephalitozoon rabiei" parasite de la rage.** [*Encephalitozoon rabiei.* The Parasite of Rabies.]—*Ann. Inst. Pasteur.* 1924. Mar. Vol. 38. No. 3. pp. 258–267. With 4 plates.

The authors figure and describe in the central and peripheral nervous systems, and in the salivary glands of human beings, dogs, rabbits, and monkeys, bodies which they identify as the causal organism of rabies.

For many years the authors have noted variations in colour and structure of Negri bodies stained by Mann's method, and these they consider are due to degenerative processes in them.

They have succeeded in obtaining clear pictures of their parasite only by strict attention to the method of fixation and staining employed.

The fixing solutions to be used are a modification of Gilson's and Dominici's.

The Gilson mixture contains equal parts of acetone, choloroform and glacial acetic acid to which an excess of perchloride of mercury is added. Immediately before use a strong alcoholic solution of iodine is added with constant stirring until the liquid acquires a deep mahogany tint.

Dominici's solution is prepared immediately before use as follows :—Tincture of iodine is added drop by drop to a saturated solution of perchloride of mercury until an orange colour is produced. To 100 volumes of this are added 12 volumes of formalin and 5 of acetic acid. The orange colour must be preserved by the addition of the requisite amount of tincture of iodine.

Fixation requires from 2 to 24 hours and the pieces of tissue are passed through alcohol or iodised acetone prior to embedding. It is advised that they should be embedded in celloidin before being passed into paraffin.

Staining is effected by immersing the sections in a solution composed of 35 cc. of 1 per cent. aqueous methyl blue, 45 cc. of 1 per cent. aqueous eosin and 100 cc. of distilled water. The slides are kept in this for 24 hours at room temperature or for a shorter time at body temperature.

After rapid washing in tap water and dehydration with alcohol the slides are treated with absolute alcohol rendered faintly alkaline with caustic soda (30 cc. with 10 drops of 1 per cent. caustic soda). When the sections become red they are washed with alcohol to remove the soda. They are then placed in tap water until they assume a bluish tint, and then placed in water containing 2 drops of acetic acid per 40 cc. After one minute they are dehydrated, cleared in xylol and mounted in balsam rendered acid with salicylic acid.

Moist fixation may be applied to smear preparations. Haidenhain's haematoxylin, Giemsa, polychrome methylene blue, and a mixture of eosin and toluidene blue have yielded good results.

The clearest pictures of the bodies which the authors consider to be the parasite of rabies have been found in the pyramidal cells of the hippocampus. Where stained by Mann's method the bodies acquire a

bright red colour. They are fusiform in shape and measure 1 to 2μ in length. In their interior there are granules and threadlike structures which stain blue. The bodies may be numerous or scanty in the cells, and they may be found in the dendrites lying parallel with the long axis.

Negri bodies may be found in cells occupied by the parasite and they may be recognised in a specimen stained by Mann's method by their orange tint and by their round or oval shape.

It is admitted that transition forms between the two may be made out. In fact, in the authors' opinion Negri bodies result from the degeneration of masses of the parasites. This is a special reaction of the nerve cell, for though the parasite is encountered in the cells of salivary glands, Negri bodies are not encountered there.

NEVEU. **Sur un case de rage.** [A Case of Rabies.]—*Rec. Méd. Vét.* 1924. Apr. 30. Vol. 100. No. 8. pp. 179–180.

The author describes a case of rabies in a dog in which the only symptoms were loss of appetite and gradually progressive paralysis.

MOUSSU (R.) & MARCHAND (L.). **L'encéphalite enzootique du cheval.** [Enzootic Encephalitis in the Horse.]—*Rec. Méd. Vét.* 1924. Feb. Vol. 100. No. 3. pp. 65–90.

In this paper the authors complete their account of enzootic encephalitis in the horse. Their previous communication was abstracted in this *Bulletin* (1924. May 31. Vol. 12. No. 2. pp. 67–70).

A number of different organisms have been encountered in the examination of brains from infected horses, but these have almost invariably failed to infect rabbits. Attention was naturally directed to the possibility that the virus might be filterable, but experiments to test this view have yielded only negative results as regards the virus of naturally infected animals. They have, however, obtained positive results after passing the virus through rabbits. They therefore conclude that it must be classed as filterable. The bacteria that have been found by various authors must be considered as accidental invaders of the nervous system, probably during the period shortly before death. Heating to 60–70°C. has been found to exercise a destructive effect upon the virus. Contact with 10 per cent. uroformine at room temperature for 12 hours failed to modify the activity of the virus. Glycerine does not destroy the virus in three weeks, but two further weeks caused its destruction. The authors have not succeeded in transmitting the disease by ingestion, the path by which the virus appears to infect in natural conditions. Foals do not contract the disease while sucking infected dams, and the authors note that in the outbreaks which they had under observation the foals on the premises all escaped infection.

Inoculation of rabbits with saliva indicated that the virus is not excreted by that path.

Little information is available regarding immunity, but it would appear that an attack does not confer protection.

FROSCH (P.). **Die Morphologie des Lungenseucheerregers. (Eine microphotographische Studie.)** [The Morphology of the Causal Organism of Bovine Pleuro-Pneumonia.]—*Arch. f. Wissenschaft. u. Prakt. Tierheilk.* 1922. Dec. 30. Vol. 49. No. 1/3. pp. 35–48. With 10 figs.

The author points out the difficulties which have been encountered in attempts to render visible the viruses which are responsible for the diseases due to filter passers. The introduction of an apparatus for photography by ultraviolet light marked a great step forward. The light used has a wave length of ·275 to ·280μ and thus the resolving powers of the lenses are considerably increased. Such rays are not visible to the human eye but they are capable of acting upon photographic plates. Owing to the greater resolving power of the lenses immense numbers of objects not previously visible come into view (in photographs) when ultraviolet light is used. Extreme care must be exercised in the cleansing of all apparatus used and the author states that quartz slides and coverslips must be used. Needless to say, controls of all kinds must be made, and, what is perhaps more important, that experience with the apparatus is essential for the interpretation of results. The original experiments were made with broth cultures of the organism, but this was subsequently given up, and cultures on solid media were used. The author recounts the difficulties he experienced in obtaining sharply focussed pictures. Although colonies can readily be stained it was found that the individual organisms were so faintly stained as to be invisible. In dried preparations staining was more intense, but this led to deformation of the elements.

With ultraviolet light the author succeeded in obtaining photographs of the individual elements forming the colonies by concentrating his attention on their margins. By this means he found that they were oval or polygonal in shape and measured from 0·2 to 0·8μ in diameter.

For the moment the author leaves the nature of the bodies undetermined.

DAHMEN (Hans). **Beitrag zum Studium der Lungenseuche des Rindviehs.** [Studies in Connexion with Bovine Pleuro-Pneumonia.]—*Arch. f. Wissenschaft. u. Prakt. Tierheilk.* 1922. Dec. 30. Vol. 49. No. 1/3. pp. 49–64.

Cultivation of the causal organism can be achieved without difficulty by adopting the following procedure. Martin's broth is made with a reaction of pH 8. To this is added 1·5 per cent. agar and the medium is sterilized at 115°C. The tubes are allowed to set in a slanting position. The water of condensation is withdrawn by a pipette and replaced by 0·5 cc. of horse serum. The tubes are incubated for 2 days in such a position that the serum spreads over the surface and dries. Colonies become just visible to the naked eye in about 5 days. When magnified the colonies shew an umbilicate appearance. The central part of the colonies grows down into the substance of the medium. With subcultivation colonies develop more rapidly and they may be visible in 2 to 3 days. The author has found that the cultures retain their viability for periods up to 2 months.

In the earliest experiments colonies were found only on the upper one-third of the surface of the medium. The degree of dryness of the agar appeared to be a determining factor in causing this, but subsequent experiments indicated that the distribution of the growth was

due to the actual formation of a dried layer of serum on the upper third of the surface, the serum elsewhere having actually soaked into the medium. In other words, it is the serum itself that is the main factor in obtaining growth. This was shewn in subsequent experiments with Martin's broth, beef broth (Rindfleischwasser), distilled water, and physiological salt solution, all of which were first brought to a reaction of pH 8 and then rendered solid with 3 per cent. agar. The tubes were subsequently treated with horse serum as before. Cultures were obtained upon all of them.

A modification was then made by mixing 2 cc. of serum with the various forms of agar described above while they were still molten and allowing the tubes to set. Cultures were again obtained.

By means of these solid media information was obtained regarding the development of growth in liquid media. A loop of definite size was used to plate out on to solid media daily and from the number of colonies obtained an estimate was made of the bacterial content per cc. of the liquid media.

The figures obtained shewed that the maximum growth had occurred by the third day. For a week onwards the bacterial content remained constant, and during the following week it shewed a slight decrease. From this point it again remained practically stationary. Sedimentation in liquid media began about the 5th day, and subcultures from the supernatent liquid and from the sediment shewed that the organism sank in the medium. It was further shewn in a series of experiments that liquid media could be freed from the organism by the use of the centrifuge. Grape sugar, milk sugar, and glycerin were added to the liquid medium with and without 8 per cent. of serum. Grape sugar in the medium containing serum was found to exert a most favourable influence on the growth of the organism. It was also found, however, that there was a marked production of acid in the medium which caused a rapid decrease in the content of living organisms. The pH of the medium on the 6th day was 7 and on the 10th day it was 6·7.

Experiments with diluted lung lymph and with cultures indicated that opalescence is not of necessity an indication of growth, for the liquid obtained by centrifuging cultures remained turbid, but it yielded no growth on subcultivation.

In obtaining cultures the lymph should be diluted with serum broth and incubated for three days ; this should then be sown out upon solid media.

In the earlier experiments liquid cultures were used as antigen in testing suspected animals, but it became clear that the antigen varied in quality from day to day and was therefore unsuitable for routine tests. This difficulty was overcome by preparing antigen from growths obtained upon solid media.

The author also furnished proof that liquid cultures could be used as antigen provided they were completely sedimented by centrifugalisation and the sediment used. But it was further found that such cultures should not be more than 5 days old, because the acidity which develops not only kills the organism but destroys the antigenic properties of the culture as well. Neutralization does not restore the property.

An alcoholic extract of a 10 day old culture sediment yielded results practically identical with those given by a similar extract of a 3 day old culture.

A further defect attaching to the use of liquid cultures as antigen was the fact that non-specific reactions were likely to be obtained. In one instance serum from an animal in a herd actually free from the disease yielded positive results. Results of this kind have not been obtained with antigen prepared from sedimented organisms.

Evidence is furnished by Dahmen that watery or alcoholic extracts of the organism sedimented from broth cultures can be used with success as antigen. The author's final selection appears to be watery extract of the organism.

A 20 per cent. dilution of this extract was also found to be useful for precipitin tests with suspected sera. It was found in the course of tests of 101 sera, in 8 tests of which complement fixation had given doubtful results, that these results were confirmed either as positive or negative by precipitin tests.

MISCELLANEOUS.

Pons (R.). **Sur l'existence, dans les liquides souillés de sang, de filaments, non organisés, pouvant être confondus avec des spirochètes.** [The Presence, in Liquids Contaminated with Blood, of Unorganized Filaments which may be confounded with Spirochaetes.]—*Bull. Soc. Path. Exot.* 1924. Apr. 9. Vol. 17. No. 4. pp. 307–309. With 1 text fig.

The author describes " filaments " which he has frequently observed when examining liquids contaminated with blood by dark ground illumination. These filaments vary greatly in appearance, but may nevertheless be divided into two groups.

The shorter forms are highly refractile and measure from 8–10μ in length and 0·2–0·3μ in thickness. The ends are slightly swollen and refractile. They are slightly curved and have the appearance of being composed of a number of small elements packed closely one against the other. These filaments never shew evidence of mobility, but they vibrate as though each element were shewing brownian movement.

The long forms are much more slender, and in some cases approach the limit of visibility. They measure 8 to 20μ in length. Like the shorter form, the ends are swollen and refractile. While they do not appear to move from place to place they shew slight undulating movements and also the vibratory movement shewn by the short forms.

These filaments can be made out with far less distinctness in smears stained with Giemsa or with silver than by dark ground illumination. It appears to be difficult to see how these structures should be confused with spirochaetes.

The filaments have been found in the blood of healthy individuals, and of persons suffering from influenza, biliary fever, and fever following rat bite. They have been found in the urine on the third day of a case of biliary fever associated with haemoglobinuria, in the blood of several guinea pigs, rabbits, and monkeys, and in haemo-cultures. No success has ever been achieved in attempts to cultivate the bodies, nor to transmit them by inoculation. The filaments have never been detected apart from blood elements. In two cases in which they were

particularly numerous there have been observed under the ultra-microscope slender filaments projecting radially round red corpuscles which are undergoing degeneration. These "pseudo-spirochaetes" resemble in many details the "pseudo-spirochaetes" described by THOMSON.

CHASSIGNEUX (André). **A propos de quelques symptômes rabiformes observés chez des chiens à Dakar.** [The Rabiform Symptoms observed in Dogs in Dakar.]—*Bull. Soc. Path. Exot.* 1924. Apr. 9. Vol. 17. No. 4. pp. 325–326.

In the author's opinion the cases occurring in Dakar in which symptoms suggestive of rabies have been observed are in reality cases of distemper.

Outlines are given of three cases.

Case 1. In May 1923 a dog shewed evidence of conjunctivitis, coryza and spasms of the pharynx. The following November the animal was said by its owner to have lost its appetite, and to be unable to swallow, save small quantities of water. Examination shewed that there was extreme weakness, ptyalism, paresis of the hind quarters. The dog barked without cause, uttering 7 or 8 short raucous cries. At the postmortem cerebral meningitis was found. This was in the author's opinion a complication of the distemper.

In the second case the symptoms were similar, and there was some dropping of the lower jaw. Paresis became more pronounced and terminated in paralysis. A diagnosis of distemper was made, and this was confirmed by the subsequent course of the disease, which terminated fatally. Distemper is of common occurrence in Dakar. During the cold weather pulmonary and cardiac forms of the disease predominate, and nervous symptoms only appear towards the end. During the hot weather the nervous form is most frequently seen.

Differential diagnosis between the disease and rabies is practically impossible if the dog is not one that is well known. Since the histology of the lesions of the nervous form of distemper resemble or are identical with those of rabies microscopic examination does not enable differentiation to be established. The inoculation of rabbits with brain substance from the cases of distemper may cause paralysis in rabbits, but this is not transmissible in series. But in view of the uncertainties of carrying on the virus rabies by inoculation in series in Senegal this point is deprived of some of its value. It cannot fail to be observed, however, that in spite of the occurrence of many cases of this so-called rabies in dogs cases of rabies do not occur among the human beings. This has led to the belief that there occurs in French West Africa a form of rabies that is not transmissible to man.

GRIFFITHS (J. A.). **Grass Sickness of Cattle: A Seasonal Gastro-Enteritis of Cattle in the Shire Highlands of Nyasaland.**—*Jl. Comp. Path. & Therap.* 1924. June. Vol. 37. No. 2. pp. 114–117.

This condition has been recognised as causing losses in cattle in Nyasaland and in the Highlands in the southern part of Tanganyika for the last 10 years. The disease makes its appearance with the onset of the rains and death is in some cases a matter of only a few hours.

The usual symptoms are cessation of rumination, lagging behind the herd, marked constipation followed by diarrhoea, weakness of the hind limbs, followed by complete prostration. There may be a mucoid discharge from the nostrils and in some cases an eruption of tiny nodules is observed all over the body. Temperature is high at the outset, but soon falls.

At the post mortem there are usually found lesions of bacillary necrosis of the liver. The spleen is normal. The abomasum and small intestine are inflamed as a rule and this inflamation may in some cases be recognised throughout the intestine. The degree of inflammation ranges from a haemorrhagic congestion to actual shedding of the epithelium. Not infrequently a considerable quantity of soil is found in the abomasum. The lungs shew no typical pathological lesion. No causal parasite of any kind has been identified. Blood inoculations and drenching with faecal matter have failed to set up the disease. Repeated chemical analyses have failed to reveal any inorganic poison. The circumstances of the outbreaks appear to suggest that over indulgence in fresh green grass after a period of feeding on harsh dry foods is the primary cause of the condition.

Purgatives are specially to be avoided in treating the disease. Small repeated doses of sodium chloride combined with rectal injections of normal saline have given some measure of success, but a drench containing half a drachm of potassium permanganate, half an ounce of sodium chloride in 1½ pints of water repeated every 2 to 4 hours, combined with large doses of normal saline per rectum, has given the best results.

PÉCAUD (G.). **Contribution à l'étude de la pathologie vétérinaire de la Colonie du Tchad.** [Veterinary Pathology in the Chad Colony.]—*Bull. Soc. Path. Exot.* 1924. Mar. 12. Vol. 17. No. 3. pp. 196–207.

The object of this paper is to emphasize the difficulties experienced in combating the enzootic and epizootic diseases occurring in the colony. The colony contains about a million head of cattle, two million sheep, over forty thousand equines, and a similar number of donkeys, and some seventeen thousand camels. The area is about 600,000 square kilometres. Cattle plague is the most serious disease encountered. It was unknown between 1893 and 1913 when it broke out again, the contagion spreading apparently from the Sudan. It appeared again in 1917 and since then seems to have established itself more or less permanently. There is evidence to shew that the first outbreak was complicated by coccidiosis. As a result of the outbreak of 1913 a considerable number of animals acquired immunity and this was responsible for a reduced percentage of infection and mortality when the disease broke out in 1917.

Bovine pleuro-pneumonia occurs throughout the colony and it has been known to exist at least since 1870 when it was reported by NACHTIGAL. Particularly severe outbreaks are encountered after a severe winter. At the commencement of such an outbreak the mortality may be as high as 70 per cent. but as it progresses the losses become less severe and a large number of animals make spontaneous recoveries. Observations indicated that an immunity lasting for more than 4 or 5

years may be acquired. Protective inoculation is being resorted to with increasing frequency, but it is carried out in a very rough and ready manner by owners with the result that the mortality usually approximates to 15 per cent. There is opposition to inoculation into the tail because loss of the tail leaves an animal more exposed to the torments of flies with resulting loss of condition.

Native vaccinators of the Veterinary Service have obtained good results by subcutaneous inoculation with lung lymph, either fresh or glycerinized, under the skin of the nose. The mortality following this procedure is below 10 per cent.

Inoculation of animals in infected herds only is advised, as deaths following inoculation of animals in uninfected districts as a part of a general campaign against the disease would create a volume of opinion opposed to the procedure.

Tsetse flies are found permanently established along the southern border of the colony and along the Rivers Chari and Logone. A few years ago flies were found still further north than the 12th parallel (approximately the present limit), but the ravages of rinderpest and other factors have tended to cause them to disappear from these areas.

The typanosomiases occurring are :

(1) An infection caused by a parasite of the congolense-dimorphon type. This is usually chronic and runs a benign course. It is readily amenable to treatment.

(2) Souma, caused by *T. cazalboui*. This is a more serious disease. The disease is found in 40 to 50 per cent. of cattle in some areas during the rains.

(3) Baleri, caused by *T. pecaudi*. This occurs as an acute or peracute disease of equines and dogs. Recovery is exceptional.

Piroplasmoses.—Information at present available is contradictory regarding the actual cause of a form of redwater occurring among the cattle and causing a mortality of 50 per cent.

Only one clear case of infection with *Nuttallia equi* has been encountered in the course of ten years. Foot and mouth disease occurs but in a benign form, causing death among calves only. The natives practise aphthization of their own accord.

Other diseases encountered are :—Camel mange, osteomalacia in horses, a microfilaria in the blood of equines, epizootic lymphangitis, and rabies. Black quarter is fortunately of rare occurrence.

JOCOTOT (H.). **L'ecthyma contagieux des lèvres chez la chèvre en Annam.** [Contagious Ecthyma of the Lips of the Goat in Annam.] —*Rec. Méd. Vét.* 1924. May 15. Vol. 100. No. 9. pp. 270–277. With 1 text fig.

The author has observed cases of ecthyma or chancre of the lips of goats on a number of occasions. In Annam, as in France, the disease does not have a definitely seasonal distribution, but in the majority of cases it is encountered between the months of October and January.

Age does not influence susceptibility to the disease, but its course is more serious in young animals. The native races of goats appear to be especially susceptible, and in a small number of cases imported animals appear to have possessed a considerable degree of immunity.

The lesions have a remarkable tendency to spread beyond the lips.

The susceptibility of the sheep has not yet been studied closely ; but it would appear that the sheep is more resistant than the goat.

Recovery leaves a durable immunity. The symptoms are infiltration of the lips followed by an eruption which subsequently spreads to the chin and nose. The lesions become pustular and covered with large thick brownish crusts. When these are removed a small quantity of pus is found beneath. The submaxillary glands are severely inflamed. The exposed pupillae which are enlarged become dry, and thus produce a velvety-like appearance.

Subsequently it develops into a papillomatous outgrowth which dries up and is shed. There is no actual scar left, but the portions of the lips involved become depigmented. As in France, lesions sometimes invade the interior of the mouth.

In a few cases lesions have been seen in unusual places, such as the eyelids, the margin of the anus, vulva, mammary gland, etc.

In adult animals the disease produces no systemic effects, unless mechanically, through rendering prehension of food, etc., difficult, and complications are not to be feared in well-nourished animals.

The disease runs its complete course in 4 to 6 weeks.

Injuries to the lips as a result of rough food appear to be a predisposing cause of the condition. Observations appear to indicate that the disease can be transmitted from animal to animal simply as a result of close contact.

ZELLER (H.). **Klinische, pathologisch-anatomische, histologische, und serologische Befunde bei 50 chronischen Fällen von ansteckender Blutarmut des Pferdes.** [Clinical, Pathological, Histological, and Serological Investigations in 50 Cases of Chronic Infectious Anaemia in the Horse.]—*Zeitschr. f. Infektionskrankh. parasit. Krankh. u. Hyg. d. Haust.* 1924. March. Vol. 26. (No. not stated.) pp. 67–86.

Generally the clinical symptoms and the course of the disease in chronic infectious anaemia in equines are not sufficiently characteristic to permit a diagnosis to be made. The symptoms are only valuable for diagnosis when they are observed in horses in infected areas or on premises where the disease is known to exist.

In the author's observations postmortem examination failed to permit a diagnosis being established in 70 per cent. of cases. But when enlargement and paleness of the spleen, with clearly marked follicles, a watery condition of the blood associated with feeble clotting power, and general paleness of the organs are found in an animal which has, during life, presented suspicious symptoms, a definite diagnosis can be made. Microscopic examination has revealed the presence of abnormalities in the liver and spleen in some thirty per cent. of cases only. In the liver cellular nodules which contain large amounts of haemosiderin are found between the columns of liver cells. In the spleen there is a reduction in the amount of iron pigments and eosinophile leucocytes are present in large numbers.

The author has been unable to devise any method of serological testing which is of any value for the diagnosis of the disease.